

Title of the Invention

**PROCESS FOR THE PREPARATION OF A CATIONIC NANOEMULSION,  
AND COSMETIC COMPOSITION**

BACKGROUND OF THE INVENTION5 Field of the Invention

The present invention relates to a process for the preparation of a cationic nanoemulsion, to a cosmetic composition obtainable by said process and to the use of said composition.

10 Discussion of the Background

The microemulsions and nanoemulsions of the prior art are well known in cosmetics and are sought for their cosmetic properties. They make it possible in particular to obtain a disentangling effect, softness,  
15 a feel, rinsability and a conditioning effect on keratin materials, such as hair, which are better than those obtained with the conventional emulsions and dispersions used in this field.

Microemulsions and nanoemulsions are generally  
20 obtained either by a high pressure homogenization process or by a phase inversion temperature process. However, these two processes exhibit major disadvantages.

In fact, the high pressure homogenization process  
25 requires specific and particularly extensive equipment to be able to work under substantial pressures ranging

from  $12 \cdot 10^7$  to  $18 \cdot 10^7$  Pa, so this process is not easy to carry out in industry.

The phase inversion temperature process (or PIT process) yields nanoemulsions whose particle size is  
5 rarely below 100 nm.

#### Summary of the Invention

The Applicant has now discovered, surprisingly, that by successively mixing, with agitation, the components of the fatty phase and non-ionic  
10 surfactants, at a temperature above the melting points of the components of the fatty phase and the non-ionic surfactants, and under normal atmospheric pressure, and then water, followed by the addition of at least one cationic surfactant, cationic nanoemulsions of the oil-  
15 in-water type are obtained which have a number-average particle size below 100 nm.

These cationic nanoemulsions obtained by this process also have cosmetic properties, such as a disentangling effect, a softness, a feel, a rinsability  
20 and a conditioning effect, which are appreciably better than the cosmetic properties of the nanoemulsions of the prior art.

This process is also easier to carry out than the two known processes of the prior art mentioned above,  
25 and do not require specific equipment.

The present invention therefore relates to a process for the preparation of a cationic nanoemulsion.

The invention further relates to a cosmetic composition in the form of a cationic nanoemulsion obtainable by said process.

5 The invention further relates to the use of said composition as a cleaning, dyeing or perming composition or as a treatment composition before or after dyeing, perming, bleaching or straightening.

The invention further relates to a method of treating keratin materials using said composition.

10 Other objects, characteristics, features and advantages of the invention will become even more clearly apparent on reading the description and the various examples which follow.

#### Brief Description of the Drawings

15 Figure 1 A ternary phase diagram of fatty phase, non-ionic emulsifying phase, and water for the determination of the zone in which a nanoemulsion of the oil-in-water type is formed.

#### Detailed Description of the Invention

20 According to the invention, the process for the preparation of a cationic nanoemulsion comprises the following steps:

(a) mixing, with agitation, of at least one fatty compound and at least one non-ionic surfactant, preferably at least two non-ionic surfactants, at a  
25 temperature  $T_m$  above the melting point of the fatty compound(s) and the non-ionic surfactant(s), under

normal atmospheric pressure, the ternary phase diagram fatty compound(s)/non-ionic surfactant(s)/water exhibiting at least one zone where a nanoemulsion phase of the oil-in-water type exists, and the concentrations of the fatty compound(s) and the non-ionic surfactant(s) being chosen so that this nanoemulsion zone can be reached simply by dilution with water,

- (b) addition of water, with agitation, so as to reach this nanoemulsion zone, and
- (c) addition of at least one cationic surfactant to the resulting nanoemulsion.

As used herein, "normal pressure" means standard pressure as known in the art, i.e., 1 atm at sea level.

The choice of proportions of the components of the nanoemulsion is therefore made on the basis of the ternary phase diagram fatty phase/non-ionic emulsifying phase/water, in which the fatty phase consists of at least one fatty compound such as described below and the non-ionic emulsifying phase consists of at least one non-ionic surfactant such as described below. This diagram makes it possible to determine the zone in which a nanoemulsion of the oil-in-water type is formed. Such a diagram is shown in Figure 1, where p represents the formation zone of said nanoemulsion.

Once the ternary phase diagram has been plotted by techniques well known to those skilled in the art, the

proportions of the emulsifying phase and the fatty phase are chosen so that the weight ratio  $\tau$  of fatty compound(s) to non-ionic surfactant(s) is between A and B, these points being shown in Figure 1.

5        This weight ratio  $\tau$  is generally below 2, preferably between 0.1 and 1.5 and better still between 0.1 and 1.

      The temperature  $T_m$  is preferably between room temperature and 100°C and better still between 20°C and  
10    85°C. Room temperature is understood to mean a temperature of about 20°C.

      Water is preferably added at around the temperature  $T_m$  and particularly preferably at a temperature  $\Theta$  of between  $T_m$  and  $T_m - 20^\circ\text{C}$ .

15        The amount of fatty compound(s) used in step (a) is generally between 1 and 30% by weight, preferably between 1 and 20% by weight, preferably between 2 and 15% by weight and particularly preferably between 4 and 12% by weight, based on the total weight of the  
20    cationic nanoemulsion.

      The amount of non-ionic surfactant(s) used in step (a) is generally between 2 and 30% by weight, preferably between 2 and 20% by weight and particularly preferably between 8 and 20% by weight, based on the  
25    total weight of the cationic nanoemulsion.

      The amount of water generally added in step (b) of the process is between 40 and 97% by weight and

preferably between 50 and 90% by weight, more preferably between 65 and 90% by weight based on the total weight of the cationic nanoemulsion.

When the nanoemulsion has been obtained, at least one cationic surfactant is added. The cationic surfactant added is preferably in the form of an aqueous solution or dispersion. The temperature at which the cationic surfactant is added is not critical, but the chosen temperature will preferably be close to  $\Theta$  or  $T_m$ .

The amount of cationic surfactant(s) used in step (c) is generally between 0.1 and 10% by weight and preferably between 0.2 and 6% by weight, based on the total weight of the cationic nanoemulsion.

The phase for cooling to room temperature can take place before or after step (c). In both cases, the particle size is preserved during this cooling, which notably is not the case in a PIT process.

The process according to the invention affords a nanoemulsion whose particles have a number-average size below 100 nm, preferably of between 10 and 100 nm and particularly preferably of between 20 and 90 nm.

The number-average particle size can be determined in particular by the known method of quasi-elastic light scattering. One apparatus that can be used for this determination is the BROOKHAVEN apparatus equipped with an SX 200 optical bench (with 532 nm laser) and a

BI 9000 correlator. This apparatus provides a measure of the mean diameter by photon correlation spectroscopy (or PCS), which makes it possible to determine the number-average diameter from the polydispersity factor, which is also measured by the apparatus.

The nanoemulsion can also be characterized by measurement of its turbidity by the NTU method using a HACH 2100P turbidimeter at room temperature. The turbidity of the nanoemulsions of the invention is generally below 400 NTU and preferably between 50 and 250 NTU.

The fatty compounds which can be used in the process according to the invention are preferably selected from fatty acid esters, transesterified or non-transesterified vegetable oils, and mixtures thereof.

Fatty acid esters which may be mentioned in particular are the compounds of the formula  $R_aCOOR_b$ , in which  $R_a$  is the radical of a saturated or unsaturated fatty acid containing from 6 to 29 carbon atoms and preferably from 8 to 22 carbon atoms, and  $R_b$  is a saturated or unsaturated hydrocarbon chain containing from 1 to 30 carbon atoms and preferably from 1 to 12 carbon atoms, such as purcellin oil (stearyl octanoate), isopropyl myristate, isopropyl palmitate, butyl stearate, hexyl laurate, diisopropyl adipate, isononyl isononanoate, 2-ethylhexyl palmitate, 2-

hexyldecyl laurate, 2-octyldecyl palmitate or 2-octyldodecyl myristate or lactate.

Vegetable oils which may be mentioned in particular are sweet-almond oil, avocado oil, castor  
5 oil, olive oil, jojoba wax, sunflower oil, wheatgerm oil, sesame oil, groundnut oil, grape seed oil, soya oil, colza oil, safflower oil, copra oil, maize oil, hazelnut oil, shea butter, palm oil, apricot kernel oil and calophyllum oil.

10 The transesterified vegetable oil used is preferably olive oil transesterified with hexanol or jojoba wax transesterified with ethanol.

The fatty compounds that are particularly preferred within the framework of the present invention  
15 are isopropyl myristate, isononyl isononanoate, jojoba wax, olive oil transesterified with hexanol, jojoba wax transesterified with ethanol, and mixtures thereof.

The non-ionic surfactants which can be used in the process of the invention are also compounds well known  
20 per se (cf. particularly "Handbook of Surfactants" by M.R. PORTER, published by Blackie & Son (Glasgow and London), 1991, pp 116-178). Thus they can be chosen especially from (non-limiting list) polyalkoxylated (2-50 mol of alkylene oxide), preferably polyethoxylated  
25 or polypropoxylated, hydrogenated or non-hydrogenated vegetable oils, C<sub>8-30</sub> fatty acid mono-, di- or triglycerides, polyethoxylated and/or polypropoxylated



alcohols, polyethoxylated and/or polypropoxylated  
alpha-diols, polyethoxylated and/or polypropoxylated  
alkylphenols having a fatty chain containing e.g. 8 to  
18 carbon atoms, it being possible for the number of  
5 ethylene oxide or propylene oxide groups to range from  
2 to 50 in particular, and mixtures thereof. The  
following may also be mentioned: ethylene  
oxide/propylene oxide copolymers, condensation products  
of ethylene oxide and propylene oxide with fatty  
10 alcohols; polyethoxylated fatty amides having  
preferably from 2 to 30 mol of ethylene oxide,  
polyglycerolated fatty amides containing an average of  
1 to 5 and particularly 1.5 to 4 glycerol groups; fatty  
acid esters of sorbitan or polyethoxylated fatty acid  
15 esters of sorbitan having from 2 to 30 mol of ethylene  
oxide; fatty acid esters of sucrose, fatty acid esters,  
preferably C<sub>8-30</sub> fatty acid esters, of polyethylene  
glycol, C<sub>8-30</sub> fatty acid esters of polyglycerol,  
alkylpolyglycosides, N-alkylglucamine derivatives and  
20 amine oxides, such as (C<sub>10</sub>-C<sub>14</sub>-alkyl)amine oxides or N-  
acylaminopropylmorpholine oxides.

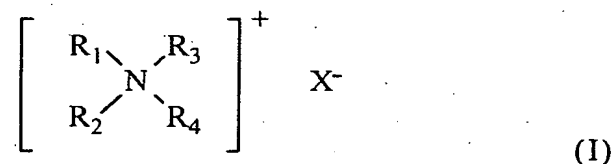
The non-ionic surfactants which are particularly  
preferred in the invention are selected especially from  
polyethoxylated hydrogenated castor oil containing 35  
25 mol of ethylene oxide (hereafter referred to as "with  
35 EO"), polyethoxylated hydrogenated castor oil  
containing 7 mol of ethylene oxide (or with 7 EO),

polyethoxylated olive oil with 7 EO, sorbitan monooleates with 4 EO, 5 EO or 20 EO, (C<sub>12</sub>-C<sub>14</sub>-alkyl)glycosides or (C<sub>8</sub>-C<sub>14</sub>-alkyl)glycosides, glycerol monostearate with 30 EO, decaglyceryl monooleate,  
 5 polyalkoxylated oleyl alcohol with 2 or 10 EO, polyethoxylated lauryl alcohol with 7 EO, methylglucoside dioleate, and mixtures thereof.

The cationic surfactants which can be used in the process according to the invention are those well known  
 10 per se, such as salts of optionally polyalkoxylated primary, secondary or tertiary fatty amines, quaternary ammonium salts and mixtures thereof.

More particularly preferred cationic surfactants are quaternary ammonium salts, for example:

15 - those of general formula (I) below:

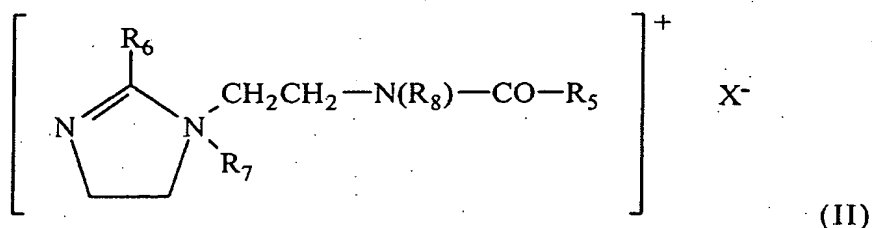


in which the radicals R<sub>1</sub> to R<sub>4</sub>, which can be identical  
 20 or different, are a linear or branched aliphatic radical containing from 1 to 30 carbon atoms or an aromatic radical such as aryl or alkylaryl. The aliphatic radicals can contain heteroatoms such as, in particular, oxygen, nitrogen, sulphur and halogens.  
 25 The aliphatic radicals are selected e.g. from alkyl,

alkoxy, polyoxyalkylene oxide (C<sub>2</sub>-C<sub>6</sub>), alkylamide, alkyl(C<sub>12</sub>-C<sub>22</sub>)amidoalkyl(C<sub>2</sub>-C<sub>6</sub>), alkyl(C<sub>12</sub>-C<sub>22</sub>) acetate and hydroxyalkyl radicals containing from about 1 to 30 carbon atoms; X is an anion selected from the group comprising halides, phosphates, acetates, lactates, alkyl(C<sub>1</sub>-C<sub>6</sub>)sulphates, (C<sub>1</sub>-C<sub>6</sub>-alkyl)sulphonates and (C<sub>1</sub>-C<sub>6</sub>-alkyl)arylsulphonates;

- quaternary ammonium salts of imidazoline, for example those of formula (II) below:

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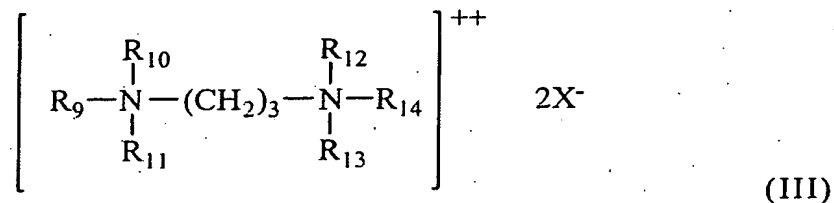


in which R<sub>5</sub> is an alkenyl or alkyl radical containing from 8 to 30 carbon atoms derived e.g. from tallow fatty acids, R<sub>6</sub> is a hydrogen atom, a C<sub>1</sub>-C<sub>4</sub>-alkyl radical or an alkenyl or alkyl radical containing from 8 to 30 carbon atoms, R<sub>7</sub> is a C<sub>1</sub>-C<sub>4</sub>-alkyl radical, R<sub>8</sub> is a hydrogen atom or a C<sub>1</sub>-C<sub>4</sub>-alkyl radical and X<sup>-</sup> is an anion selected from the group comprising halides, phosphates, acetates, lactates, alkylsulphates, alkylsulphonates and alkylarylsulphonates. Preferably, R<sub>5</sub> and R<sub>6</sub> are a mixture of alkenyl or alkyl radicals containing from 12 to 21 carbon atoms derived e.g. from tallow fatty acids, R<sub>7</sub> is a methyl radical and R<sub>8</sub> is a

hydrogen atom. Such a product is marketed e.g. under the name REWOQUAT® W 75 by REWO;

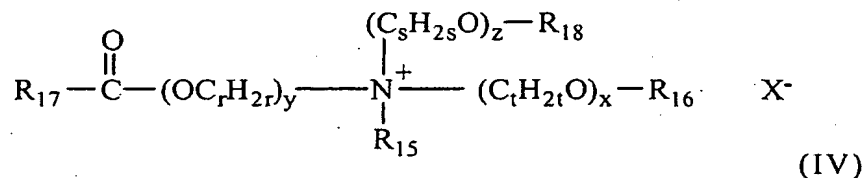
- the quaternary diammonium salts of formula (III):

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in which R<sub>9</sub> is an aliphatic radical containing approximately from 16 to 30 carbon atoms, R<sub>10</sub>, R<sub>11</sub>, R<sub>12</sub>,  
 10 R<sub>13</sub> and R<sub>14</sub>, which are identical or different, are selected from hydrogen and an alkyl radical containing from 1 to 4 carbon atoms, and X is an anion selected from the group comprising halides, acetates, phosphates, nitrates and methylsulphates. Such  
 15 quaternary diammonium salts include propanetallow-diammonium dichloride in particular; and

- quaternary ammonium salts containing at least one ester group, such as those of formula (IV) below:



20

in which:

$R_{15}$  is selected from  $C_1$ - $C_6$ -alkyl radicals and  $C_1$ - $C_6$ -hydroxyalkyl or  $C_1$ - $C_6$ -dihydroxyalkyl radicals;

$R_{16}$  is selected from:

5

- the radical  $R_{19}-\overset{\text{O}}{\parallel}{\text{C}}-$
- saturated or unsaturated, linear or branched  $C_1$ - $C_{22}$  hydrocarbon radicals  $R_{20}$ , and
- 10 - the hydrogen atom;

$R_{18}$  is selected from:

- the radical  $R_{21}-\overset{\text{O}}{\parallel}{\text{C}}-$
- saturated or unsaturated, linear or branched
- 15  $C_1$ - $C_6$  hydrocarbon radicals  $R_{22}$ , and
- the hydrogen atom;

$R_{17}$ ,  $R_{19}$  and  $R_{21}$ , which are identical or different, are selected from saturated or unsaturated, linear or branched  $C_7$ - $C_{21}$  hydrocarbon radicals;

20  $r$ ,  $s$  and  $t$ , which are identical or different, are integers with values of 2 to 6;

$y$  is an integer with a value of 1 to 10;

$x$  and  $z$ , which are identical or different, are integers with values of 0 to 10; and

25  $X^-$  is a simple or complex organic or inorganic anion;

with the proviso that the sum  $x + y + z$  has a value of 1 to 15, that when  $x$  has a value of 0,  $R_{16}$  is  $R_{20}$ , and that when  $z$  has a value of 0,  $R_{18}$  is  $R_{22}$ .

The alkyl radicals  $R_{15}$  can be linear or branched  
5 and more particularly linear.

$R_{15}$  is preferably a methyl, ethyl, hydroxyethyl or dihydroxypropyl radical and more particularly a methyl or ethyl radical.

The sum  $x + y + z$  advantageously has a value of 1  
10 to 10.

If  $R_{16}$  is a hydrocarbon radical  $R_{20}$ , it can be long and have from 12 to 22 carbon atoms or it can be short and have from 1 to 3 carbon atoms.

If  $R_{18}$  is a hydrocarbon radical  $R_{22}$ , it preferably  
15 has 1 to 3 carbon atoms.

Advantageously,  $R_{17}$ ,  $R_{19}$  and  $R_{21}$ , which are identical or different, are selected from saturated or unsaturated, linear or branched  $C_{11}$ - $C_{21}$  hydrocarbon radicals and more particularly from saturated or  
20 unsaturated, linear or branched  $C_{11}$ - $C_{21}$ -alkyl and  $C_{11}$ - $C_{21}$ -alkenyl radicals.

$x$  and  $z$ , which are identical or different, preferably have values of 0 or 1.

$y$  is advantageously equal to 1.

25  $r$ ,  $s$  and  $t$ , which are identical or different, preferably have values of 2 or 3 and more particularly are equal to 2.

The anion is preferably a halide (chloride, bromide or iodide) or an alkylsulphate, more particularly methylsulphate, but it is possible to use methanesulphonate, phosphate, nitrate, tosylate, an  
 5 anion derived from an organic acid, such as acetate or lactate, or any other anion compatible with ammonium carrying an ester group.

The anion  $X^-$  is more particularly chloride or methylsulphate.

10 The ammonium salts of formula (IV) which are used more particularly in the composition according to the invention are those in which:

- $R_{15}$  is a methyl or ethyl radical;
- $x$  and  $y$  are equal to 1;
- 15 -  $z$  is equal to 0 or 1;
- $r$ ,  $s$  and  $t$  are equal to 2;
- $R_{16}$  is selected from:

- the radical  $R_{19}-\overset{\overset{O}{\parallel}}{C}-$
- 20 - methyl, ethyl or  $C_{14}-C_{22}$  hydrocarbon radicals, and
- the hydrogen atom;
- $R_{18}$  is selected from:

- 25 - the radical  $R_{21}-\overset{\overset{O}{\parallel}}{C}-$
- and

- the hydrogen atom;
- $R_{17}$ ,  $R_{19}$  and  $R_{21}$ , which are identical or different, are selected from saturated or unsaturated, linear or branched  $C_{13}$ - $C_{17}$  hydrocarbon radicals and preferably from saturated or unsaturated, linear or branched  $C_{13}$ - $C_{17}$ -alkyl and  $C_{13}$ - $C_{17}$ -alkenyl radicals.

The hydrocarbon radicals are advantageously linear.

Examples which may be mentioned are compounds of formula (IV) such as salts (especially chloride or methylsulphate) of diacyloxyethyl dimethylammonium, diacyloxyethyl hydroxyethyl methylammonium, monoacyloxyethyl dihydroxyethyl methylammonium, triacyloxyethyl methylammonium, monoacyloxyethyl hydroxyethyl dimethylammonium and mixtures thereof. The acyl radicals preferably have 14 to 18 carbon atoms and originate more particularly from a vegetable oil such as palm or sunflower oil. If the compound contains several acyl radicals, these can be identical or different.

These products are obtained e.g. by the direct esterification of optionally alkoxylated triethanolamine, triisopropanolamine, alkyldiethanolamine or alkyldiisopropanolamine with fatty acids or with mixtures of fatty acids of vegetable or animal origin, or by the transesterification of their methyl esters. This esterification is followed by quaternization with an



alkylating agent such as an alkyl (preferably methyl or ethyl) halide, a dialkyl (preferably dimethyl or diethyl) sulphate, methyl methanesulphonate, methyl paratoluenesulphonate, glycol chlorohydrin or glycerol chlorohydrin.

Such compounds are marketed e.g. under the names DEHYQUART<sup>®</sup> by HENKEL, STEPANQUAT<sup>®</sup> by STEPAN, NOXAMIUM<sup>®</sup> by CECA and REWOQUAT<sup>®</sup> WE 18 by REWO-WITCO.

An example of a mixture of ammonium salts which can be used is a mixture containing 15 to 30% by weight of acyloxyethyldihydroxyethylmethylammonium methylsulphate, 45 to 60% of diacyloxyethylhydroxyethylmethylammonium methylsulphate and 15 to 30% of triacyloxyethylmethylammonium methylsulphate, the acyl radicals having from 14 to 18 carbon atoms and originating from optionally partially hydrogenated palm oil.

It is also possible to use the ammonium salts containing at least one ester group which are described in patents US-A-4874554 and US-A-4137180.

Preferred quaternary ammonium salts of formula (I) are on the one hand tetraalkylammonium chlorides, for example dialkyldimethylammonium or alkyltrimethylammonium chlorides in which the alkyl radical contains approximately from 12 to 22 carbon atoms, particularly behenyltrimethylammonium chloride (Genamin<sup>®</sup> KDMP from Clariant) and

distearyldimethylammonium, cetyltrimethylammonium and benzyldimethylstearylammonium chlorides, and on the other hand palmitylamidopropyltrimethylammonium chloride or

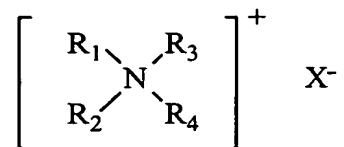
- 5 stearamidopropyldimethyl(myristyl acetate)ammonium chloride marketed under the name CERAPHYL<sup>®</sup> 70 by VAN DYK.

The particularly preferred cationic surfactants in the process of the invention are selected from  
10 quaternary ammonium salts and in particular from palmitylamidopropyltrimethylammonium chloride, cetyltrimethylammonium chloride and behenyltrimethylammonium chloride.

The present invention further relates to a  
15 cosmetic composition in the form of a cationic nanoemulsion of the oil-in-water type whose particles have a number-average size below 100 nm, preferably of between 10 and 100 nm and particularly preferably of between 20 and 90 nm. It comprises at least one fatty  
20 compound, at least one and preferably at least two non-ionic surfactants in an amount of 2 to 30% by weight, at least one cationic surfactant, all as described above, and water, in proportions such that the weight ratio  $\tau$  of fatty compound(s) to non-ionic surfactant(s)  
25 is from 0.1 to 1.5 and particularly preferably from 0.1 to 1,

Said cationic surfactant is selected from:.

- those of general formula (V) below:



in which the radical R<sub>1</sub> is a linear or branched aliphatic radical containing from 8 to 30 carbon atoms or an aromatic radical such as aryl or alkylaryl, the radicals R<sub>2</sub> to R<sub>4</sub>, which can be identical or different, are a linear or branched aliphatic radical containing from 1 to 6 carbon atoms, in particular alkyl or hydroxyalkyl; and X is an anion selected from the group comprising halides, phosphates, acetates, lactates, alkyl(C<sub>1</sub>-C<sub>6</sub>)sulphates, (C<sub>1</sub>-C<sub>6</sub>-alkyl)sulphonates and (C<sub>1</sub>-C<sub>6</sub>-alkyl)arylsulphonates;

The aliphatic radicals R<sub>1</sub> can contain heteroatoms such as, in particular, oxygen, nitrogen, sulphur and halogens. The aliphatic radicals are selected e.g. from alkyl, alkoxy, (C<sub>2</sub>-C<sub>6</sub>), alkylamide, alkyl(C<sub>12</sub>-C<sub>22</sub>)amidoalkyl(C<sub>2</sub>-C<sub>6</sub>), alkyl(C<sub>12</sub>-C<sub>22</sub>) acetate and hydroxyalkyl radicals containing from about 8 to 30 carbon atoms;

- quaternary ammonium salts of imidazoline, for example those of formula (II)

- the quaternary diammonium salts of formula (III);

- quaternary ammonium salts containing at least one ester group, such as those of formula (IV).

Preferred quaternary ammonium salts of formula (V) are alkyltrimethylammonium chlorides in which the alkyl radical contains approximately from 12 to 22 carbon atoms, particularly behenyltrimethylammonium chloride (Genamin<sup>®</sup> KDMP from Clariant) and cetyltrimethylammonium, and palmitylamidopropyltrimethylammonium chloride or stearamidopropyldimethyl(myristyl acetate)ammonium chloride marketed under the name CERAPHYL<sup>®</sup> 70 by VAN  
5  
10 DYK.

The particularly preferred cationic surfactants in the process of the invention are selected from quaternary ammonium salts and in particular from palmitylamidopropyltrimethylammonium chloride, cetyltrimethylammonium chloride and  
15 behenyltrimethylammonium chloride.

The compositions according to the invention comprise the fatty compound(s), the non-ionic surfactant(s) and the cationic surfactant(s) in a weight ratio fatty compound(s)/(non-ionic surfactant(s) + cationic surfactant(s)) that is generally below 1.5 and preferably between 0.1 and 1.  
20

These compositions are obtainable by the process of the invention such as described above.

25 The pH of the compositions of the invention is generally between 3 and 8 and preferably between 4 and 7.

The compositions according to the invention can also contain additives such as cationic, anionic, non-ionic or amphoteric polymers, modified or unmodified non-volatile silicones, associative or non-associative, 5 natural or synthetic, anionic, amphoteric, zwitterionic, non-ionic or cationic polymeric thickeners, non-polymeric thickeners such as electrolytes, sugars, pearlescent agents, opacifiers, sun filters, vitamins or provitamins, perfumes, 10 colourants, organic or mineral particles, preservatives and pH stabilizers.

Those skilled in the art will take care to choose any additives and their amount in such a way that they do not detract from the properties of the compositions 15 of the present invention.

These additives are present in the composition according to the invention in an amount ranging from 0 to 50% by weight, based on the total weight of the composition.

20 The compositions can be used e.g. as cleaning, dyeing or perming compositions or as treatment compositions before or after shampoo, dyeing, perming, bleaching or straightening. Preferably, the compositions of the invention are conditioners.

25 The present invention further relates to a method of cosmetic treatment of keratin materials which consists in applying an effective amount of a cosmetic

composition, such as described above, to the keratin materials and in rinsing, if appropriate, after an optional period of exposure.

The examples which follow illustrate the present invention but must not be considered in any way as implying a limitation.

#### EXAMPLES

The compositions of Examples 1 to 14 according to the invention are prepared by the procedure of the invention from the ingredients indicated in Tables 1 to 3 below. Cationic nanoemulsions were ultimately obtained.

Table 1

	Amount in % by weight				
	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5
Hydrogenated castor oil with 35 EO <sup>(1)</sup>	9	7.5	15	11.8	9.75
Hydrogenated castor oil with 7 EO <sup>(2)</sup>	3	2.5	-	3.9	3.25
Olive oil with 7 EO <sup>(3)</sup>	-	-	5	-	-
Isopropyl myristate	8	-	-	-	-
Isononyl isononanoate	-	-	-	-	7
Jojoba wax transesterified with ethanol	-	10	-	6.8	-
Jojoba wax	-	-	-	1.2	-
Olive oil transesterified with hexanol	-	-	8.6	-	-
Palmitylamidopropyltrimethylammonium chloride <sup>(4)</sup>	-	-	-	-	1.5
Cetyltrimethylammonium chloride (AS)	-	-	2	-	-
Behenyltrimethylammonium chloride <sup>(5)</sup> (AS)	1.6	1.6	-	1.4	-
Aminated silicone microemulsion (AS)	-	1.2	-	-	-
Glycerol	-	-	-	5	-
Water qs	100	100	100	100	100

AS: active substance

- (1): sold under the name ARLATONE® 980 by ICI
- (2): sold under the name ARLATONE® 989 by ICI
- (3): sold under the name OLIVEM® 300 by B&T
- (4): sold under the trade name Varisoft® PATC by WITCO
- 5 (5): sold under the trade name Genamin® KDMP by Clariant GmbH



Table 2

	Amount in % by weight				
	Ex. 6	Ex. 7	Ex. 8	Ex. 9	Ex. 10
Sorbitan monooleate with 20 EO <sup>(1)</sup>	9.6	-	-	-	2.4
Sorbitan monolaurate <sup>(2)</sup>	2.4	-	-	-	-
Polyethoxylated oleyl alcohol (10 EO) <sup>(3)</sup>	-	10	9.6	-	-
Polyethoxylated oleyl alcohol (2 EO) <sup>(4)</sup>	-	-	2.4	-	-
Polyethoxylated linear C <sub>12</sub> -C <sub>14</sub> alcohol (7 EO) <sup>(5)</sup>	-	-	-	12	-
Methylglucoside dioleate <sup>(6)</sup>	-	-	-	-	9.6
Isopropyl myristate	8	10	-	7	-
Isononyl isononanoate	-	-	-	-	8
Jojoba wax transesterified with ethanol	-	-	8	1	-
Cetyltrimethylammonium chloride (AS)	-	-	2	2	-
Behenyltrimethylammonium chloride <sup>(7)</sup> (AS)	1.6	1.6	-	-	1.5
Aminated silicone microemulsion (AS)	-	1.2	-	-	-
Water qs	100	100	100	100	100

<sup>(1)</sup>: sold under the trade name Tween® 80 by Uniquema

<sup>(2)</sup>: sold under the trade name Span® 20 by Uniquema

- (3): sold under the trade name Brij® 96 by Uniquema
- (4): sold under the trade name Brij® 92 by Uniquema
- (5): sold under the trade name Synperonic® L7 by Uniquema
- (6): sold under the trade name Glucate® DO by Amerchol
- 5 (7): sold under the trade name Genamin® KDMP by Clariant GmbH

Table 3

	Amount in % by weight			
	Ex. 11	Ex. 12	Ex. 13	Ex. 14
Glycerol monostearate (30 EO) <sup>(1)</sup>	3.6	-	-	-
Decaglyceryl monooleate <sup>(2)</sup>	8.4	5	-	-
Sorbitan monooleate with 20 EO <sup>(3)</sup>	-	5	-	-
(C <sub>12</sub> -C <sub>14</sub> -alkyl)glycoside <sup>(4)</sup>	-	-	1.6	-
Sorbitan monolaurate with 4 EO <sup>(5)</sup>	-	-	6.4	-
(C <sub>8</sub> -C <sub>14</sub> -alkyl)glycoside <sup>(6)</sup>	-	-	-	3
Sorbitan monooleate with 5 EO <sup>(7)</sup>	-	-	-	7
Isopropyl myristate	7.5	-	12	10
Jojoba wax transesterified with ethanol	-	10	-	-
Jojoba wax	0.5	-	-	-
Palmitylamidopropyltrimethylammonium chloride <sup>(8)</sup>	-	-	-	2
Cetyltrimethylammonium chloride	-	-	2	2
Behenyltrimethylammonium chloride <sup>(9)</sup> (AS)	1.6	1.6	-	-
Aminated silicone microemulsion (AS)	-	1.2	-	-
Glycerol	-	-	-	5
Water qs	100	100	100	100

<sup>(1)</sup>: sold under the trade name Tagat<sup>®</sup> S by Goldschmidt

<sup>(2)</sup>: sold under the trade name Decaglyn<sup>®</sup> 1-0 by Nikkol

5 <sup>(3)</sup>: sold under the trade name Tween<sup>®</sup> 80 by Uniquema

- (4): sold under the trade name GlucoPON® 600 C sup by Cognis
- (5): sold under the trade name Tween® 21 by Uniquema
- (6): sold under the trade name GlucoPON® 650 EC/hh sup by Cognis
- (7): sold under the trade name Tween® 81 by Uniquema
- 5 (8): sold under the trade name Varisoft® PATC by WITCO
- (9): sold under the trade name Genamin® KDMP by Clariant GmbH

The number-average particle size and the turbidity of the compositions of Examples 1 to 14 were measured  
10 by methods such as described above to give the following results:

- a number-average particle size strictly below 100 nm, and
- a turbidity strictly below 150 NTU.

15

When applied to hair as conditioners, these compositions give said hair softness, suppleness and smoothness, and tone.